

**RESPONSE UNDER 37 CFR 1.116  
EXPEDITED PROCEDURE  
EXAMINING GROUP 1641**

**PATENT**  
Attorney Docket No. 202406

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

Nie et al.

Application No. 09/405,653

Art Unit: 1641

Filed: September 24, 1999

Examiner: C. Chin

For: **WATER-SOLUBLE  
LUMINESCENT QUANTUM  
DOTS AND BIOMOLECULAR  
CONJUGATES THEREOF AND  
RELATED COMPOSITIONS AND  
METHODS OF USE**

**PENDING CLAIMS**

1. A water-soluble luminescent semiconductor quantum dot, which comprises a core, a cap and a hydrophilic attachment group, wherein said hydrophilic attachment group is an organic group comprising a sulfur atom and at least one hydrophilic substituent selected from the group consisting of a sulfonic acid or salt thereof, a sulfamic acid or salt thereof, a quaternary ammonium salt, and a hydroxy, wherein the water-soluble luminescent semiconductor quantum dot remains in solution for at least one day.
2. The water-soluble luminescent semiconductor quantum dot of claim 1, wherein the hydrophilic attachment group is attached to said quantum dot via the sulfur atom.
5. The water-soluble luminescent semiconductor quantum dot of claim 1, wherein said organic group is a C<sub>1</sub>-C<sub>6</sub> alkyl group or an aryl group.

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6. The water-soluble luminescent semiconductor quantum dot of claim 1, wherein said organic group is a C<sub>1</sub>-C<sub>6</sub> alkyl group.
7. The water-soluble luminescent semiconductor quantum dot of claim 1, wherein said hydrophilic attachment group is a thiol alcohol.
9. The water-soluble luminescent semiconductor quantum dot of claim 1, wherein the core of the quantum dot is selected from the group consisting of IIB-VIB semiconductors, IIIB-VB semiconductors, and IVB-IVB semiconductors and the size of the core is from about 1 nm to about 10 nm.
10. The water-soluble luminescent semiconductor quantum dot of claim 9, wherein the core of the quantum dot is selected from the group consisting of IIB-VIB semiconductors and the size of the core is from about 2 nm to about 5 nm.
11. The water-soluble luminescent semiconductor quantum dot of claim 10, wherein the core of the quantum dot is CdS or CdSe.
12. The water-soluble luminescent semiconductor quantum dot of claim 11, wherein the core of the quantum dot is CdSe.
13. The water-soluble luminescent semiconductor quantum dot of claim 12, wherein the size of the core is about 4.2 nm.
14. The water-soluble luminescent semiconductor quantum dot of claim 1, wherein the cap is selected from the group consisting of IIB-VIB semiconductors of high band gap.
15. The water-soluble luminescent semiconductor quantum dot of claim 14, wherein the cap is ZnS.

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16. The water-soluble luminescent semiconductor quantum dot of claim 11,  
wherein the cap is ZnS.

17. The water-soluble luminescent semiconductor quantum dot of claim 14,  
wherein the cap is CdS.

18. The water-soluble luminescent quantum dot of claim 12, wherein the cap is  
CdS.

21. A composition comprising the water-soluble luminescent semiconductor  
quantum dot of claim 1 and an aqueous carrier.